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Personality and technology: Big five personality traits as descriptors of universal acceptance and usage of technology UTAUT.

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Abstract

Presently, information professionals are progressively dependent on information and communication technologies to complete their everyday tasks. As, result dependence on PC frameworks, programming and data innovation-related technologies are increasing for better working and providing quality services. Therefore, to understand, analyze and evaluate the acceptance and use of this technology several models of technology acceptance and use have been formulated in information science literature. Using eight such models, Venkatesh, Morris, Davis and Davis proposed a unified model called the Unified Theory of Acceptance and Use of Technology or (UTAUT) model. The UTAUT model has been studied and analyzed in various spheres including education, banking, health, tourism, e-government services and its recent application in the personality studies. The application of UTAUT model to the core constructs of big five personality traits have been utilized to predict the adoption and usage of technology according to different personality types such as neurotic, open to experience, extravert, conscientious and agreeable.

Keywords: *Technology Usage and Acceptance, UTAUT, Big Five Personality Traits, Technology and Personality.*

Introduction

In today's world, professionals have become increasingly reliant on information and communication technology to carry out their daily operations. As, result organizations big or small are continuously investing in computer systems, software and information technology-related products and services. However, without full cooperation from professionals, these investments do not positively translate into productivity expansion and competitive gains. When individuals acknowledge and incorporate

technologies in their daily work, their actual usage could link information technologies to their recognizable advantages **(Devaraj & Kohli, 2003)**. Therefore, to explain the acceptance and use of technology, several models have been explained and validated in the information science (IS) literature. These models have incorporated different theoretical frameworks of acceptance such as management information systems, psychology and sociology **(Venkatesh, Morris, Davis & Davis, 2003)**. One of the most significant models including the Technology Acceptance Model (TAM) by **Davis (1989)** describes the behavioral intention of the user's to use and accept technological innovations. This model is dependent on theoretical predictors of technology use i.e. perceived ease of use (EU) and perceived usefulness (U) and behavioral intention (BI) variable. Another technology acceptance model is known as TAM2 devised by **Venkatesh and Davis (2002)** which explains perceived usefulness and usage intentions in the frame of social influence and cognitive instrumental procedures. Using such eight different models and theories **Venkatesh, Morris, Davis and Davis (2003)** proposed a unified model called the Unified Theory of Acceptance and Use of Technology or "UTAUT" model. According, to the authors of this model "UTAUT provides a useful tool for managers needing to assess the likelihood of success for new technology introductions and helps them understand the drivers of acceptance in order to proactively design interventions (including training, marketing, etc.) targeted at populations of users that may be less inclined to adopt and use new systems" (p.426). Further, **AbuShanab, Pearson and Setterstrom (2010)** are of the view that "the UTAUT represents a shift from a fragmented view of technology acceptance to a unified view that integrated the major theories and technology acceptance models into a single theory". UTAUT model has been studied and validated in different fields of learning such as education **Dečman (2015); Nur, Faslih and Nur (2017); Kechine and Augier (2019)** banking **Bhatiasevi (2016)**; **Raza**, **Shah and Ali (2019); Tarhani, Masari, Ali and Serrano (2016)**; tourism **Boes, Borde and Egger (2015); health Hoque and Sarwar (2017); Sittig and Singh (2015)**; e-government services **Al Awadhi and Morris (2008); Alshehri, Drew, Alhussain and Alghamdi (2012); Rodrigues, Sarabdeen and S. Balasubramanian (2016) and Wang, Hung and Chou (2006)**. The UTAUT model takes into consideration the wide range of constructs, which trace their foundation from the actual technology

acceptance and usage theories such as system usefulness, and ease of use. These two constructs are supported by factors like performance expectancy, effort expectancy, social influence, facilitating conditions, and behavioral intentions. According to **Venkatesh, Morris, Davis and Davis (2003)**, the UTAUT model should improve with additional constructs such as individual differences. In addition to this theory, **Barnett, Pearson, Pearson and Kellermanns (2015)** suggest, "Although individual differences such as gender and age are considered as potential moderators of the aforementioned variables' impact on technology use, the UTAUT does not consider the direct impact of individual differences on technology use". In this consideration, **McElroy, Hendrickson, Townsend and DeMarie (2007)** suggest, "more research is needed to investigate promising individual differences. The first step is to reintroduce dispositional personal factors into models of technology use and adoption. TAM2 **Venkatesh and Davis (2000)** and UTAUT **Venkatesh, Morris, Davis and Davis (2003)** are two viable candidates'' (p. 818). Most importantly, the construct personality difference has received a good amount of attention in the scholarly literature of technology acceptance and usage studies, which was earlier ignored (**McElroy, Hendrickson, Townsend & DeMarie, 2007)**. Despite, the fact that individual differences have been reported its acceptance and usage driven by key factors like a relative advantage, complexity, social influence, facilitating conditions, and perceived enjoyment **(Al-Adwan, Al-Madadha & Zvirzdinaite, 2018)**. The combination of personality studies with other studies have led to fruitful observations and explanations such as personality traits and Social **Media Correa, Hinsley, & De Zuniga (2010); Fox and M. C. Rooney (2015)** ; **Hughes, Rowe, Batey and Lee (2012) and Mo, Zhou, Kosinski, and Stillwell(2018)** Online gaming **Delhove and Greitemeyer (2018) and Kim, Namkoong, Ku and Kim (2008);** Virtual reality **Senese et. al (2018); Information seeking behavior Al-Samarraie, Eldenfria and Dawoud (2017)**; Mobile technologies **Halko and Kientz (2018) and Nunes, Limpo, Lima and Castro (2018)** and even excessive use of technology **Hussain and Pontes (2018)**. Since, the correlation between personality and technology most of the studies have not directly integrated personality traits in technology acceptance models like TAM and UTAUT **(Barnett, Pearson, Pearson and Kellermanns, 2015)**. However, one of the groundbreaking research regarding personality

and technology was reported by **McElroy, Hendrickson, Townsend and DeMarie (2007)** including both TAM and UTUAT. They examined big five traits, self-efficacy, locus of control, Myers–Briggs cognitive style type of personality traits in relation to self-reported internet use and buying and selling activities of respondents. **Devaraj, Easley and Crant (2008)** studied TAM with respect to Big Five personality traits (conscientiousness, extraversion, agreeableness, openness, and neuroticism) and reveled ‘‘recent advances in personality psychology suggest that a fruitful way to integrate individual traits into IS models and theories would be to adopt the five-factor model (FFM), a parsimonious and comprehensive framework of personality’’ (p. 93). Further**, Aldás-Manzano, Lassala-Navarré, Ruiz-Mafé and Sanz-Blas (2009)** studied TAM concerning innovativeness and intentions to utilize mobile technology, finding innovativeness was positively associated with intentions. **AbuShanab, Pearson and Setterstrom (2010)** reflected on UTUAT model with the examination of personality traits into the online banking usage model and finding self-efficacy, anxiety, innovativeness and locus of control were positively associated with intentions to use technology. **Svendsen, Johnsen, Almås-Sørensen and Vittersø (2013)** studied TAM and related Big Five personality traits with the behavioral intentions to use a hypothetical software tool, finding that perceived usefulness and ease of use were fully interceded by conscientiousness and extraversion, whereas emotional stability directly affected intention and openness was directly associated with perceived ease of use but not behavioural intentions. **Barnett, Pearson, Pearson and Kellermanns (2015)** linked the Big five factors of personality with the conceptual framework of UTAUT model in the context of web-based classroom technological system, by utilizing technological constructs such as perceived and actual usage of technology, finding that conscientiousness and neuroticism were associated with perceived and actual usage of technology with conscientiousness displaying both positive and negative association with both of the constructs. Whereas neuroticism demonstrating a neuroticism a negative association. Extraversion was also associated with actual use but not in the direction as expected. Further, **Lakhal and Khechine (2017)** enriched UTAUT model in relation to big five personality traits by examining the relationships of the five factors to variables regarding acceptance and use of desktop video conferencing in higher education. The structural

model revealed that performance expectancy; social influence had an indirect effect on behavioral intention. Moreover, neuroticism had a momentous negative effect on performance expectancy, effort expectancy and facilitating conditions, agreeableness positively influenced effort expectancy, and conscientiousness elucidated effort expectancy. The integration of Big Five personality traits with the UTAUT model will provide a chance in improved understanding of behavioral intention to use technology in relation to acceptance and use technology.

Theoretical development of the Unified Theory of Acceptance and Usage Model UTAUT

As described earlier Unified Theory of Acceptance and Use of Technology model also known as the UTAUT model joins a wide assortment of theories starting from the primary hypothetical models of acceptance and usage of ICT. These eight different models of information science laid the foundations of the UTAUT model **(Figure.1)**. This model identifies four constructs, which significantly determined the acceptance and usage of technology by users **(Venkatesh, Morris, Davis & Davis, 2003).** The four constructs are 1)performance expectancy,2) effort expectancy, 3) social influence and 4) facilitating conditions and four moderating variables – 1)gender, 2) age, 3)experience and 4) voluntariness of use. Performance expectancy as defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance **(Barnett, Pearson, Pearson and Kellermanns 2015 &; Lakhal and Khechine 2017 & Venkatesh, Morris, Davis & Davis 2003)**. This construct share similarity with previous other technology acceptance and usage theories like perceived usefulness (TAM/TAM2), extrinsic motivation, job-fit, relative advantage and outcome expectations. Effort expectancy is defined the degree of ease of use as recognized by the user associated with the use of the system **(Barnett, Pearson, Pearson and Kellermanns 2015; Lakhal and Khechine 2017 & Venkatesh, Morris, Davis & Davis 2003)**. It has similarity with the previous three constructs such as perceived ease of use (TAM), complexity and ease of use. Social influence construct is characterized by the degree as how much an individual sees that significant others trust the person should utilize the new system **(Barnett, Pearson, Pearson and Kellermanns 2015; Lakhal and Khechine 2017 & Venkatesh,**

Morris, Davis & Davis 2003). Social influence as a direct determinant of user behavioural intention has been related to TRA, TAM2, TPB/DTPB and C-TAM-TPB, social factors in MPCU, and image in IDT **(Figure.1).** "Facilitating conditions is defined as the perceived level of organizational and technical support for the system. This construct is conceptualized in the UTAUT as a direct predictor of technology use" **(Barnett, Pearson, Pearson and Kellermanns 2015; Lakhal and Khechine 2017 & Venkatesh, Morris, Davis & Davis 2003)**. This definition identifies three different constructs, which represent perceived behavioral control, facilitating conditions, and compatibility **(Figure.1)**. In addition to this, the UTAUT model strongly believes the other moderating factors such as age, gender, experience and voluntariness of use may directly influence the situational constructs and technology acceptance and use **(Barnett, Pearson, Pearson and Kellermanns, 2015).**

(Figure.1) Models of acceptance of technology selected by (Venkatesh, Morris, Davis, and Davis (2003) to formulate the UTAUT model.

Models and theories of acceptance of technology	Constructs considered	Authors
Theory of research action (TRA)	Attitude towards behaviour	Fishbein and Ajzen (1975)
	Subjective norms	
Technology acceptance model (TAM)	Perceived usefulness	Davis (1989); Davis, Bagozzi, and Warshaw (1989)
	Perceived ease of use	
	Subjective norm	
Motivational model (MM)	Extrinsic motivation	Davis, Bagozzi, and Warshaw (1992)
	Intrinsic motivation	
Theory of planned behaviour (TPB)	Attitude towards behaviour	Ajzen (1991); Schifter and Ajzen (1985)
	Subjective norm	
	Perceived behavioural control	
Decomposed theory of planned behaviour (DTPB)	Attitude towards behaviour	Taylor and Todd (1995)
	Subjective norm	
	Perceived behavioural control	
	Perceived usefulness	
Model of PC utilization (MPCU)	Job-fit	Thompson et al. (1991)
	Complexity	
	Long-term consequences	
	Affect towards use	
	Social factors Facilitating conditions	
Innovation diffusion theory (IDT)	Relative advantage	Moore and Benbasat (1991)
	Ease of use	
	Image	
	Visibility	
	Compatibility	
	Results demonstrability	
	Voluntariness of use	
Socio-cognitive theory (SCT)	Outcome expectations—performance	Compeau and Higgins (1995)
	Outcome expectations—personal	
	Self-efficacy	
	Affect	
	Anxiety	

SOURCE: Lakhal & Khechine (2017)

Personality defined in terms of Big Five Model and ICT acceptance and usage.

Personality is defined as behaviours, actions, characteristics of a person. Moreover, how people react to different kind of situations and circumstances contribute to their subjective experiences. According to people's attitudes, beliefs, cognitions and behaviours are in part determined by their personality; another way of stating this is that psychological predispositions have main effects upon several individual-level variables. Further**, Pervin and John (2001)** also hold fast to a similar definition by which ''personality

represents those characteristics of the person that account for consistent patterns of feeling, thinking, and behaving'' (p. 10). As explained by various personality authors these individual behaviours, actions, characteristics and experiences can broadly be categorized under traits. Personality traits are "typically defined as descriptions of people in terms of relatively stable patterns of behaviour, thoughts, and emotions" (McCrae & Costa, 2003). According to **Lounsbury, Park, Sundstrom, Williamson and Pemberton (2004)**, different types of personality traits can illustrate different personality types such as extraversion, optimism, assertiveness, openness, and emotional stability and other rare traits consisting of conscientiousness and tough-mindedness including a diversity of personality inventories. According to **Lakhal and Khechine (2017)** researchers interested in incorporating personality into the UTAUT model were confronted with an overwhelming number of personality traits but over time personality was defined in terms of five superordinate constructs called as big five personality traits **(Digman, 1990).** The big five personality traits or five-factor model (FFM) has been widely studied and further developed **(Costa and McCrea, 1992a; 1992b; Norman, 1963; Goldberg, 1990; John, Naumann & Soto, 2008)**. According to **McCrae & John (1992),** the five-factor structure has generalized across measures, cultures, and sources of ratings. The five-factor model of personality is neuroticism also known as emotional instability (emotional, stress, anxiety, impulsiveness, depression, anger and vulnerability), agreeableness (altruism, compliance, straightforwardness and modesty), openness to experience (innovativeness, feelings, ideas and values) conscientiousness (dutifulness, achieving, self-discipline and order), extraversion (gregarious, activity, open and positive emotions). **Lakhal and Khechine (2017)** have presented the big five personality traits along with their definitions and associated personality traits as defined in **Costa and McCrea (1992b)** in **(Figure. 2)**

(Figure.2) Big five personality traits

Some traits characterizing a student with a high score	The five factors of personality	Some traits characterizing a student with a low score
	Neuroticism	
Worried, nervous, emotional, maladjusted, hypochondriac	Could identify students prone to psychological distress, unrealistic ideas, needs or excessive desires and inappropriate coping strategies	Calm, relaxed, phlegmatic, robust, secure, satisfied
	Extraversion	
Sociable, active, talkative, open to others, optimistic, fun-loving, affectionate	Assesses the quantity and the intensity of interpersonal interaction, the level of activity, the need for stimulation and the ability to have fun	Reserved, sober, undemonstrative, remote, task-oriented, discreet, quiet
	Openness to experience	
Curious, eclectic, creative, original, imaginative, unconventional	Assesses proactive research and ability to appreciate experiences, to tolerate uncertainty and explore	Conformist, realistic, exclusive, poorly developed sense of art
	Agreeableness	
Compassionate, easy going, confident, helpful, indulgent, gullible, franc	Assesses the quality of interpersonal orientation of the student along a continuum, compassion to antagonism in ideas, feelings and actions	Cynical, rude, defiant, uncooperative, vindictive, ruthless, irritable, manipulator
	Conscientiousness	
Organized, reliable, hardworking, disciplined, punctual, meticulous, careful, ambitious, persevering	Assesses the degree of organization, perseverance and motivation in the behaviour of a student oriented towards a goal. Compares a reliable and meticulous student to another non-chalant and neglecting	Aimless, unreliable, lazy, careless, lax, careless, indecisive, hedonistic

Source: Kechine and Lakhal (2017)

Five-factor model and other works

Some of the recent studies have defined personality in terms of five personality traits relating it with acceptance and usage of technology. For instance, **Lounsbury, Moffitt, Gibson, Drost and Stevens (2007)** studied big five personality traits about job and career satisfaction of IT professionals. It was reported that personality traits such as assertiveness, emotional resilience, extraversion, openness, teamwork disposition, customer service orientation, optimism, and work drive were positively related to job and career satisfaction. **Ehrenberg, Juckes, White and Walsh (2008)** analyzed the role of

personality traits and self-esteem in students (N=200) use of communication technologies such as mobile phones and instant messaging and it was observed that disagreeable individuals with low self-esteem spent increased time on calls as well as on instant messaging. Whereas neurotic individuals with low self-esteem reported higher use of mobile phone technologies as well as instant messaging. Further, **Witt, Massman and Jackson (2011)** studied video game playing, overall computer and communication technology use concerning individual differential characteristic that predicted their use include socio-demographic characteristics (gender, ethnicity, and parental income) and personality characteristics (self-esteem, the Big Five personality factors). It was found that youth increased their overall computer and technology use and decreased video game playing. **Rosen and Kluemper (2008)** studied the impact of big five personality traits on acceptance of social networking website Facebook by analyzing two factors of technology such as perceived usefulness and perceived ease of use. The findings include extroversion positively influence both perceived ease of use and perceived usefulness, as well as conscientiousness, was found to positively influence perceived ease of use. Openness and agreeableness did not significantly influence the perceived usefulness of Facebook technology. **Lane and Manner (2011)** discovered that personality was associated with smartphone ownership and usage (n = 312). Also, demographics were considered (gender, age, education, income and ethnicity) as control variables. They found that extraverted individuals were more likely to own a smartphone and utilize the texting function of smartphones, while more agreeable individuals pay more attention on using the smartphone to make calls and less importance on texting. **Al-Qirim et al. (2018)** investigated the personality characteristics of information technology students in relation to big five personality traits. They found that agreeableness, extraversion, openness, and conscientiousness respectively were the most important strategies adopted by information technology students whereas neuroticism trait scored the lowest of all. From this interpretation of research, it is elucidated that big five personality traits can predict and justify technology acceptance and usage and can directly predict UTAUT outcome variables.

The big five personality factors

Neuroticism

Neuroticism is the tendency of a person to encounter negative emotions such as fear, guilt, anger, humiliation, discomfort, anxiety, sadness and guilt. The most problematic factor for such kind of individual is the management of stress. Low neurotic people can cope with stressful situations without much emotion **(Costa & McCrea, 1992a)**. Similarly, an information science professional setup, professional when faced with new challenges such as the adoption of new technology and its use can lead to various issues. For most of the professionals, acceptance and adoption of new technology can bring threatening and stressful consequences **(Lakhal & Kechine, 2017)**. According to **Mount and Barrick (1995)**, the "private self-manifestation of neuroticism is marked by feelings of nervousness, worrying, and insecurity and the public perspective of neuroticism may also contribute to workplace incivility". Behaviours associated with "nervousness and insecurity (e.g., fidgeting, nervous speech, excessive talking, ruminating aloud) may be viewed by others as unusual or bothersome and may make the outwardly neurotic individual a provocative target of incivility" **(Milam, Spitzmueller & Penney, 2009)**. Moreover, **McElroy, Hendrickson, Townsend and DeMarie (2007)** found a positive association between neuroticism and internet buying and selling. Besides, **Devaraj, Easley and Crant (2008)** found that neuroticism had a negative influence on the perceived use of ICT. **Suls and Martin (2005)** argued about neurotic personalities that negative individuals display emotions that are more negative when they experience problems from their environment. Thus, neuroticism does not promote active learning atmosphere and in case of professionals who have even a slightly neurotic tendency in personality are likely to be open to change, accept and adopt new technologies.

Extraversion

Extraverted people are open-minded, sociable, assertive, fun-loving, affectionate and opportunists. It is predictive of a wide variety of job tasks and thus appears relevant to job and classroom tasks related to learning **(Barrick & Mount, 1991)**. Extraverts like interacting and being social while demonstrating good interpersonal qualities. They are energetic, like challenges and are predisposed to experience

positive emotion **Lakhal and Kechine (2017)** whereas; high introverted people are reserved, task-oriented and quiet **(Costa & McCrea, 1992a)**. **Svendsen, Johnsen, Almås-Sørensen and Vittersø (2013)** found that extraversion influenced behavioral intentions through perceived usefulness and ease of use in a TAM model. **McElroy, Hendrickson, Townsend and DeMarie (2007)** while studying the integrated TAM/UTAUT model found no significant impact of extraversion. Also, professionals with extroverted personality can accept and adapt to new technology owed to their change and challenge accepting traits.

Agreeableness

In a work, environment professionals who possess agreeableness are confident, easy-going, indulgent and helpful. They are cooperative and have a socially stable personality. They possess a greater motivation to achieve interpersonal intimacy, which should lead to greater levels of well-being **(Lakhal & Khechine, 2017)**. This personality trait is associated with being "courteous, flexible, trusting, good-natured, forgiving, cooperative, soft-hearted and tolerant" **(Barrick & Mount, 1991)**. Agreeable professionals are very trusting towards an organization and would believe in the organization decision to use new technology to improve performance and quality. Further, previous work on the FFM by **McElroy, Hendrickson, Townsend and DeMarie (2007); Svendsen, Johnsen, Almås-Sørensen and Vittersø (2013)** in TAM or UTAUT models, with the exemption **Devaraj, Easley and Crant (2008**) have not found that agreeableness notably impacts technology acceptance or use.

Openness to Experience

Openness to experience converses openness to change. Professionals with openness to change are curious, exploratory, risky, creative and original. They are able to appreciate new experiences, tolerate uncertainty and explore. In the context of technology acceptance and use, open to experience students would thus be curious to try new technologies and appreciate its use. Like conscientiousness, openness is linked to a strong motivation to learn **(Major, Turner & Fletcher, 2006).** In addition to this **McElroy, Hendrickson, Townsend and DeMarie (2007)** found openness to experience to predict overall use.

Devaraj, Easley and Crant (2008) all predicted the direct impact of openness to experience to performance expectancy. Professionals who exhibit this personality trait seek out new opportunities to exhibit their creativity.

Conscientiousness

The high descriptors of conscientious personality are reliable, hardworking, punctual, disciplined, meticulous and persevering nature of professionals. Low conscientious people are unreliable, lazy, lax, weak-willed and hedonistic **(Costa & McCrea, 1992a)**. Concerning the specific relationship of conscientiousness to technology use **McElroy, Hendrickson, Townsend and DeMarie (2007, p. 811)** point out that the FFM is of interest "because of its established link to behaviors and cognitions". **Devaraj, Easley and Crant (2008, p. 93)** state that the FFM is "associated with a number of organizational processes, behaviors, and outcomes and that we expect conscientious people to be more likely to carefully consider whether technology provides an opportunity to further on-the-job achievement and then act based on that assessment; conscientiousness will be related to the enactment of intentions". Workers with conscientiousness tend to perform better on work-related tasks. In the TAM-based study **Svendsen, Johnsen, Almås-Sørensen and Vittersø (2013)** found that conscientiousness was associated with behavioral intentions to use hypothetical software technology. Conscientious individuals report higher grade point average, greater job satisfaction, greater job security, and more positive as well as committed in the social relationship **(Farhadi, Fatimah, Nasir, Shahrazad, 2012)**. Professionals who score high on conscientiousness are achievement-oriented and are most likely to accept and use better technologies **(Lakhal and Khechine, 2017)**.

Conclusion

Recent research trends have laid stress on different personality variables and technology acceptance models. However, information science researchers emphasize the role of technological models beyond acceptance in which UTAUT has a big role to play. The significant role played by determinants like technology acceptance and technology adoption for a thorough assessment of user behavior. The UTAUT

model, which essentially integrates eight different theories of information science, has proved to be significant. The four constructs of UTAUT performance expectancy, effort expectancy, social influence and facilitating conditions along with its four moderating variables gender, age, experience, and voluntariness of use make this model ideal for its application in different fields of study, which makes it a technically dynamic model. The advent of ICT has changed the nature of information production and use. This revolution has rendered advancement in the working of organizations and professionals. Therefore, the different paradigms of technology acceptance and usage can be studied with the application of the UTAUT model. Moreover, the application of UTAUT model to the core constructs of big five personality traits can be utilized to predict the usage of technology according to different personality types such as neurotic, open to experience, extravert, conscientious and agreeable. In addition, the study of technology in libraries can predict its acceptance and usage by each personality type to predict its better application in a professional setup of by its working professionals and users.

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